R E M A R K S

Claims 11-30 remain in the case.

Applicants express appreciation for Examiner Pryor's efforts to progress prosecution, his suggestion to have a telephonic interview, and the Response to Arguments section of the present Office Action. We wish to express our sincere appreciation to Alton N. Pryor for making the time available for the telephonic interview with John F. Sieberth, (a registered patent attorney representing Albemarle Corporation) on May 23, 2011. During the interview, issues involved in the prosecution of this application were discussed.

For the convenience of the reader, a table listing the post-Interference Office Action mailing dates and principal prior art rejections accompanies this Response as Exhibit A.

I.

A.

This application has undergone an Interference, No. 105,230. At the end of the Interference, a decision was rendered by the Board of Patent Appeals and Interferences (the Board) in Paper No. 78, a copy of which is submitted with this Response as Exhibit B. Applicants note that Interferences are necessarily conducted by the Board, per 37 C.F.R. §41.103. In other words, the case was not under the Board's jurisdiction via an Appeal from a rejection of the claims by the Examiner.

We turn now to the substance of Paper No. 78, captioned Decision – Rehearing. In this paper, the Board directed that the Examiner reject the claims in the application as they stood for anticipation under §102(b) or obviousness under §103(a) either over Goodenough alone or over Goodenough in view of facts found in Exhibits 1001, 1073, 2014, 2021, 2022, and 2023. The Board noted that

> [T]he examiner must enter and maintain the recommended rejection unless an amendment or showing of facts not previously of record is filed which, in the opinion of the examiner, overcomes the recommended rejection. (Paper No. 78, Page 5, lines 10-14).

First, the Examiner has followed the Board's directive, and rejected the claims as anticipated by Goodenough alone and as obvious over Goodenough in view of Exhibits 1001, 1073,

2014, 2021, 2022, and 2023 in four Office Actions (mailed on May 21, 2007; February 7, 2008; August 8, 2008; and March 4, 2009; see Exhibit A). Further, Applicants submitted new claims that contain additional features not present in Claim 6, and have amended these new claims during subsequent prosecution since the time of the Board's decision. Therefore, if these claims, in the opinion of the Examiner, overcome the rejection, the rejection may be withdrawn.

Regarding the claims, present Claim 21 is directed to formulations which, during preparation, have a pH in the range of 13.0 to 14.0 while the bromine chloride is added. Similarly, present Claim 11 is directed to processes in which the pH is in the range of about 13.0 to about 14.0 during the bromine chloride addition. Claim 6 (the independent claim involved in the Interference at the time of the Board's decision) read as follows:

> 6. A stabilized, bromine-based biocide prepared by adding bromine chloride to an overbased, alkali metal sulfamate solution formed from water, sulfamic acid and alkali metal base, and cooling the solution.

For purposes of comparison, present Claim 21 is shown below.

> 21. A stabilized aqueous biocidal formulation preparable by adding bromine chloride to an alkali metal sulfamate solution formed from water, sulfamic acid and alkali metal base, *wherein the pH of said alkali metal sulfamate solution is in the range of about 13.0 to about 14.0 during said bromine chloride addition.*

The most pertinent difference between present Claim 21 and Claim 6 is that the feature of the present claims already mentioned, that the pH of the product solution is maintained in a range of about 13.0 to about 14.0 during the bromine chloride addition, while Claim 6 had no requirement regarding a pH value. As already mentioned, present Claim 11 also has the feature that the pH of the alkali metal sulfamate solution is in the range of about 13.0 to about 14.0 during the bromine chloride addition.

B.

During prosecution, the Office found that Claims 11-30 are novel over Goodenough standing alone and nonobvious over Goodenough in view of Exhibits 1001, 1073, 2014, 2021, 2022, and 2023 of the Interference. See in this connection Page 2, first paragraph, of

the Office Action mailed on October 8, 2009, where it is stated:

> Applicant's arguments, see paper, filed 8/4/09, with respect to the rejection(s) of claim(s) 11-30 under 102(b) and 103(a) have been fully considered and are persuasive. Therefore, the rejection has been withdrawn. … The amendment filed 8/4/09 contains data which distinguish instant process over that of Goodenough's process.

Applicants appreciate the Examiner's recognition of the patentability of Claims 11-30 over these references. Also appreciated is the Examiner's observation that the data submitted on 8/4/09 distinguishes over Goodenough.

The Office Action mailed on October 8, 2009, contained only §112 rejections. A Response with amendments was filed, and these rejections were overcome, as indicated in the Office Action of March 30, 2010. However, in the Office Action of March 30, 2010, a new ground of rejection was set forth: Claim 11-30 were alleged to be obvious under 35 U.S.C. §103(a) over Goodenough et al. (U.S. 3,558,503; hereinafter "Goodenough") in view of Dallmier et al. (U.S. 5,683,654; hereinafter "Dallmier"); see Exhibit A. This rejection still stands.

II.

Applicants believe that the present claims are nonobvious over the cited references, as detailed below. Thus we again address the issue of obviousness in regard to the combination of Goodenough with Dallmier. Since the Office Actions mailed from March 30, 2010, onward contain the same sole §103(a) rejection over Goodenough in view of Dallmier et al., the arguments below may at least in part repeat some of the arguments that were presented in previous Responses.

The Office's position relative to Goodenough and Dallmier is given in the sentence bridging Pages 3 and 4 in the Office Actions mailed on March 30, 2010; August 8, 2010; and March 30, 2011:

> It would have been obvious to modify Goodenough's process to include step of increasing the pH of the final solution to 13-14 as indicated in Dallmier … thus arriving at a method encompassed by [present Claims 11-30].

A.

The Office Action suggests that the present claims "do not show proper representation for BrCl." (Office Action, Page 4, line 21.) This is clarified later in the Office Action, where it is stated that "Applicants do not show a true representation of BrCl in the claims." (Office Action, Page 5, line 5.) As explained in previous Responses and below, BrCl is an equilibrium mixture of BrCl, Br_2, and Cl_2. According to the Mills et al. paper[1], BrCl is pure "only at relatively low temperatures in the solid state" (Page 161, bottom of left column). Thus, bromine chloride is always an equilibrium mixture of BrCl, Br_2, and Cl_2 when in the gas phase. Applicants submit that the claims do properly recite bromine chloride.

In the Response to Arguments section of the Office Action at Page 4, line 18, it is observed that "The major focus of Applicants' argument is on BrCl and how it truly exists." During the telephone conference with Examiner Pryor and Supervisory Patent Examiner Marschel on December 7, 2010, it was agreed that the technical issues in this case involve the nature and characterization of bromine chloride (BrCl), and it was agreed to keep the focus of that Response on issues surrounding bromine chloride (BrCl).

Another issue raised in the Office Action concerns the Declaration by inventor Christopher J. Nalepa that Applicants filed on August 4, 2009. A question is raised in the present Office Action regarding the moles of hydroxide employed in the inventive run in the Declaration of Nalepa:

> [T]he Table … shows only 0.125 moles of hydroxide for the Goodenough et al. whereas the Table discloses 2.025 moles hydroxide for the present invention. (Office Action, Page 5, last line, to Page 6, line 2; Page 6, last line, to Page 7, line 2.)

The larger number of moles of hydroxide is explained in part by the larger amount of halogen added to the inventive solution and in part by the higher pH of the inventive solution relative to the solutions prepared according to Goodenough (Second Declaration of Nalepa, paragraph 6).

B.

1.

[1] Already made of record during prosecution. Full citation: Mills et al., Bromine Chloride: an Alternative to Bromine, *Ind. Eng. Chem. Prod. Res. Develop.*, 1973, **12**, 160-165. Exhibit 2014 in Interference No. 105,230.

As mentioned above, Applicants filed a Declaration by inventor Christopher J. Nalepa with the Response that was filed on August 4, 2009. In the Office Action following submission of that Declaration (mailed on October 8, 2009), the rejections over Goodenough and Goodenough in view of Exhibits 1001, 1073, 2014, 2021, 2022, and 2023 had been withdrawn. Despite this, the present Office Action refers to Table 1 in the Declaration of Nalepa and states that

> This Table does not appear to show a side by side comparison of instant invention versus Goodenough et al.'s invention. (Office Action, Page 6, lines 2-3; Page 7, lines 2-3.)

The present Office Action further states that

> Until a side-by-side comparison is done, the instant combination of references makes the 12 wt % - 18 wt % active bromine obvious. (Office Action, Page 7, lines 3-4.)

First, Applicants believe that the experiments reported in the Declaration of Nalepa do constitute a side-by-side comparison, which is underscored by the withdrawal of the rejections after the Declaration of Nalepa was filed. More specifically, Solution B of Goodenough's Example 3 was repeated as described in Goodenough; and Solution B of Goodenough's Example 3 was repeated as described in Goodenough, but using an equivalent amount of NaOH instead of $Mg(OH)_2$ (paragraph 6 of the Declaration of Nalepa). The reagents in the two solutions of Goodenough were added in the order listed in Table 1 of the Declaration of Nalepa (water, sulfamic acid, Br_2, base). The solution according to the present claims was prepared by forming an overbased aqueous solution from water, sulfamic acid, and sodium hydroxide; BrCl was added to the overbased solution. These solutions were then subjected to the same stability test. Surprisingly, the solution according to the present claims (which employed NaOH as the base) was significantly more stable than the Goodenough solution that also employed NaOH as the base. Applicants request further clarification regarding what further side-by-side experiments the Office has in mind.

Referring again to the above-quoted passage, Goodenough does not teach or suggest 12 to 18 wt% (120,000 to 180,000 ppm) active bromine, as in present Claims 13 and 23. Goodenough mentions that the bromine values can reach 100,000 ppm (column 1, lines 39-42). Preferred bromine values in Goodenough have an upper limit of 50,000 ppm (column 2, lines 65-69). The Examples of Goodenough use $27^1/_2$ ppm (Table I); 1760 ppm or 1820 ppm

(Table II); and about 10,000 ppm (Example 3, at column 4, lines 74-75). Goodenough thus encourages formation of solutions with significantly lower amounts of active bromine than 100,000 ppm. It would not have been obvious to one of ordinary skill in the art to make a solution with a higher amount of active bromine, especially in light of Goodenough's remarks immediately following the disclosure of the upper limit of 100,000 ppm bromine values:

> The bromine values in these solutions, however, are susceptible to decomposition during storage and prior to use and the solutions lose their beneficial properties. (Column 1, lines 42-45.)

This statement implies that such high concentrations of active bromine are wasteful, and thereby discourages high concentrations of active bromine. Thus, Claims 13 and 23, which are directed to active bromine concentrations of about 120,000 to about 180,000 ppm, are nonobvious over the cited references for this additional reason.

2.

Regarding the order of addition, the Office Action states that

> It would have been obvious to modify Goodenough's process to include step of increasing the pH of the final solution to 13-14 as indicated in Dallmier in order to minimize the formation of the suspected carcinogen bromate during storage. (Office Action, Pages 3-4.)

The Office Action also states that

> In the absence of an unexpected showing for the instant ordering of steps, the combination of Goodenough and Dallmier make instant ordering of steps obvious. (Office Action, Page 4, lines 10-11; Page 6, lines 11-15.)

The improper combination of Goodenough and Dallmier will be discussed below. As noted above, unexpected results have been shown. The present claims do not have a step of increasing the pH of a final solution, but instead provide a pH of about 13.0 to about 14.0 throughout the process, a feature which would not have been obvious to one of ordinary skill in the art from the improper combination of Goodenough and Dallmier. In addition, inventor Nalepa explains that having the pH at a very high value throughout the process, especially by adding the entire amount of base initially, provides biocidal solutions that have greater thermal stability than solutions obtained by preparations at lower basic pH values and then raising the pH to the final high pH value (Second Declaration of Nalepa, paragraph 7).

Moreover, Goodenough observes that the stabilization of the bromine values is better when hydroxide is added to the solution last (column 2 lines 12-15, emphasis added; see also Example 3). In Example 1 of Dallmier, the only part of the disclosure addressing the addition of base, the base is added to the solution last. Hence, the only common feature of the processes of Goodenough and Dallmier is a preference or requirement for adding hydroxide (base) last. In contrast, in the presently claimed processes, enough base is present *during the process* so that the pH is about 13.0 to about 14.0 throughout the process. Therefore, Goodenough and Dallmier strongly encourage later addition of base, and thus would not have made the presently claimed invention obvious to one of ordinary skill in the art.

The Office Action at Page 3, lines 9-10, says that "the modification of Goodenough makes the stability results provided in Nalepa's Declaration obvious." As already described, the stability results reported in the Declaration of Nalepa are unexpected, and so cannot be obvious. Furthermore, as discussed in the preceding paragraph, modification of Goodenough with Dallmier to increase the pH of the final solution would not have made the present claims, much less their stability results, obvious to one of ordinary skill in the art.

3.

The first paragraph on Page 3 of the Office Action acknowledges that

(1) Dr. McKinnie's Declaration with respect to the low solubility of alkaline earth metal hydroxide (magnesium hydroxide in Goodenough) in water makes it impossible to make an aqueous solution having a pH of at least 13 when alkaline earth metal is the sole source of hydroxide; and

(2) Goodenough's method yields a biocide having a pH of from about 8 to about 10, whereas the presently claimed method yields a biocide having a pH ranging from 13.0 to 14.0.

Applicants appreciate the recognition of these points.

Despite providing the acknowledgments referred to in the preceding paragraph, the Office Action supports the rejection by suggesting that

> [T]he mixing of magnesium hydroxide with sulfamic acid result in an alkaline metal salt of sulfamic acid which is functionally equivalent to the instant alkali metal salt (sodium) of sulfamic acid. (Office Action, Page 2, penultimate

sentence.)

The results achieved for an alkaline earth metal (Mg) salt of sulfamic acid and an alkali metal (Na) salt of sulfamic acid are considerably different from each other, as shown in the Declaration of Nalepa. As described above, for the Declaration, the preparations of solutions in accordance with Goodenough's Example 3, both as described in Goodenough with $Mg(OH)_2$, and by replacing the $Mg(OH)_2$ with an equimolar amount (based on hydroxide) of NaOH. In these experiments, a final pH of 13 or greater was not attained with either $Mg(OH)_2$ or NaOH. The pH of the solution prepared with $Mg(OH)_2$ was 8.75, while the solution prepared with NaOH had a pH of 11.55. Thus, Goodenough does not show solutions having a pH of about 13 or greater, regardless of whether the hydroxide is $Mg(OH)_2$ or an alkali metal hydroxide (Declaration of Nalepa, paragraph 6, Table 1).

In this connection, the repeated preparation of Solution B from Goodenough's Example 3, and the analogous preparation with NaOH, as described in the Declaration of Nalepa, provided interesting results. In particular, the stability (as measured by activity in ppm Br_2) is significantly *lower* for the solution according to Goodenough made with *sodium* hydroxide. After four days at 40°C, the Goodenough solution prepared with NaOH retained only 69% of its original activity, while the solution prepared with $Mg(OH)_2$ as in Goodenough retained 97% of its original activity (Declaration of Nalepa, paragraph 9, Table 2). In sharp contrast to the results of Goodenough, the inventive solution (prepared with NaOH) retained <u>99%</u> of its original activity. Clearly, the teachings of Goodenough indicate that alkali metal bases provide solutions which are inferior to those with alkaline earth bases for retention of activity. Thus, the presently claimed solutions *do* provide unexpected results – much higher retention of activity while using an alkali metal base.

C.

1.

The combination of Goodenough and Dallmier is improper. A reference must be considered for all that it teaches, *Beckman Instruments v. LKB Produkter AB*, 892 F.2d 1547, 1551, 13 U.S.P.Q.2d 1301, 1304 (Fed. Cir. 1989), including portions that teach away from their combination. When the teachings of both Goodenough and Dallmier are considered <u>as a whole</u>, rather than selecting individual portions therefrom, it is clear that these references are

inconsistent with each other. Indeed, Dallmier regards the Goodenough process to be hazardous because of the use of diatomic halogen as well as formation of bromate, a suspected carcinogen, and shows that the way to avoid these problems is to conduct the process described by Dallmier. Thus, it is not proper to cite Dallmier for its teaching that the pH of the final solution is 13.0 to 14.0, while ignoring Dallmier's disclosures regarding the halogen source and the order of addition. Reconsideration and withdrawal of the rejection, which requires the combination of Goodenough and Dallmier, is respectfully requested.

The Office Action at Page 3, lines 11-12, correctly quotes Dallmier as disclosing a process that "improves on the Goodenough reference by means of a safer, easier, and more economical process" (column 2, lines 45-47, emphasis added). This quotation supports the position that Dallmier improves on the Goodenough disclosure by providing a **different** process from that of Goodenough. In other words, Dallmier does not improve on the process of Goodenough. Actually, Dallmier: 1) points out deficiencies and shortcomings of the Goodenough process; 2) discards the Goodenough process; and 3) provides a different process as a replacement, which process is stated to be safer, easier, and more economical than the process taught in Goodenough.

2.

In the processes of the cited references, the halogen sources are quite different. Goodenough uses bromine (Br_2) as the halogen source. In sharp contrast, Dallmier et al. does not use diatomic halogen molecules. In fact, Dallmier strongly discourages use of bromine (Br_2) as taught by Goodenough. At column 2, lines 28-32, Dallmier states:

> Because elemental bromine is used in the process disclosed in the Goodenough, et al. reference, this process is difficult to complete as well as potentially hazardous since elemental bromine is a fuming, corrosive, toxic liquid.

Thus, Dallmier explicitly teaches away from combination with Goodenough, and there is no reason for one of ordinary skill in the art to combine Dallmier with Goodenough, which employs bromine (Br_2) as the bromine source.

Further support for the hazardous nature of Br_2 is found in the Declaration of Mills submitted as Exhibit 2021 during Interference 105,230:

> Liquid or gaseous bromine presents a serious health hazard. The liquid rapidly attacks the skin and other tissues to produce irritation and necrosis. The maximum vapor concentration considered safe for an eight hour exposure is less than 1 ppm. Liquid and gaseous bromine are extremely corrosive to most metals; thus bromine containers and equipment used for shipping, storage and chemical processes require special metal such as lead, monel, nickel as well as glass or plastic lined steel to prevent corrosion and subsequent hazardous releases of bromine. (Page 6, paragraph 20).

Dallmier et al. deliberately eliminates use of elemental bromine, and solves the problem of the handling issues and corrosive nature of diatomic halogens (such as Br_2) by avoiding their use altogether. Dallmier accomplishes this by combining an aqueous hypochlorite solution and an aqueous bromide source (column 3, lines 59-61); the bromide source is typically a bromide salt, usually an alkali metal bromide salt (column 4, lines 33-36). Clearly, Dallmier does not employ diatomic halogen molecules to form the biocides taught therein.

The present claims employ bromine chloride (BrCl), not Br_2, as the bromine source. BrCl is also hazardous, as noted in the Specification at Page 2, lines 1-6:

> "Bromine chloride is a fuming, red liquid or gas, with a boiling point of 5°C, and a vapor pressure of 1800 mm at 25°C. It corrodes most metals in the presence of water."[2]

Bromine chloride is a gas at room temperature (boiling point 5°C). However, many of the concerns raised by Mills in the above passage regarding Br_2 also apply to BrCl.

One of ordinary skill in the art, upon reviewing the Dallmier disclosure, would see no value in trying to modify the Goodenough process. Instead, the Dallmier disclosure would clearly lead one to explore reactants and reactions along the lines of Dallmier's process technology, which is considerably different from that of Goodenough. Moreover, the Dallmier disclosure teaches that the process described therein is superior to the Goodenough process.

3.

Another incompatibility of the processes of Goodenough and Dallmier for forming halogen-based biocidal solutions involves the manner in which the reagents are combined. In

[2] See also Weast, R.C., ed., *CRC Handbook of Chemistry and Physics*, 63rd edn., Boca Raton: CRC Press, Inc., 1982, Page B-84, which accompanies this Response as Exhibit C.

particular, Goodenough states that the order of addition is not critical (column 2, lines 10-12). Conversely, the Dallmier order of addition is critical, as pointed out in column 6, lines 33-36, and in column 7, lines 51-52. In Goodenough, the halogen is the second reagent added to the solution (Example 3, solution A) or the third (Example 3, solution B); in both instances, the stabilizer (sulfamic acid) is already present in the solution. Dallmier insists that the halogen be added to the solution first, and importantly, that a period of time pass before a stabilizer (alkali metal sulfamate) is added.

Dallmier necessarily stabilizes the hypobromite formed before raising the pH of the solution (column 10, lines 3-6) because of the tendency for bromate formation from hypobromite in basic solution. Thus, Dallmier leads away from the presently-claimed invention by discouraging processes in which a stabilized bromine biocide composition is formed in solutions already having a high pH.

Furthermore, Dallmier makes clear why the process therein involves deliberate differences from the Goodenough process (and from the presently-claimed process as well). Thus at column 2, lines 59-63, Dallmier points out:

> Since NaOBr is synthesized by the following reaction, $NaOCl + NaBr \rightarrow NaOBr + NaCl$, addition of the stabilizer prior to bromide oxidation would not permit the formation of NaOBr.

In other words, the bromide ion source and the alkali or alkaline earth metal hypochlorite must be allowed to react to form an aqueous solution of unstabilized alkali or alkaline earth metal hypobromite before the stabilizer is added. Thus, Dallmier teaches that it is unfavorable to conduct processes for formation of the biocide solutions at high pH values. This limits and discourages other points of addition for the base in such processes, because Dallmier et al. teaches that it is best to stabilize the bromine values before increasing the pH of the solution, and reinforces that the base should be added last. Advantageously, the stability results in Table I of Dallmier (column 6, lines 29-35) show that the process described therein, wherein a critical order of addition and different materials as described above are used, is far superior to the Goodenough process.

Some of the above is recognized in the Office Action, which states that Goodenough et al. and Dallmier et al. do not teach the use of BrCl as bromine

> source or the instant ordering of steps to yield biocide. (Office Action, Page 4, first full sentence.)

Applicants appreciate this observation and submit that since both references fail to teach or suggest both BrCl *and* the claimed order of addition, the present claims are nonobvious over the cited references.

D.

The Office Action improperly conflates the bromine source of Goodenough (Br_2) with that of the present claims (BrCl):

> Note, the active steps in the prior art and instant process involves the mixing of the same chemicals: bromine source, sulfamic acid and base. (Page 4, lines 12-13.)

and then states

> [T]he chemical composition is the same for the prior art invention and instant invention. (Office Action, Page 4, lines 13-14.)

First, this sounds like an anticipation rejection, but that rejection has been withdrawn, as mentioned above. The Office action also says that

> [I]t is obvious that the solution yielded in Goodenough would be equivalent to the instant solution in terms of chemical and physical properties. (Office Action, Page 4, lines 7-9.)

Similarly, the obviousness rejection of the claims over Goodenough in view of Exhibits 1001, 1073, 2014, 2022, and 2023 has been overcome, as also mentioned above.

Goodenough cannot and does not form BrCl. Applicants refer to the previously-filed Response[3], in which the nature of BrCl and its equilibrium were set forth in detail. Although presented in one or more previous Responses, the differences between Br_2 and BrCl (and the resultant solutions) are set reproduced herein.

The Second Declaration of Dr. McKinnie[4] describes a method for differentiating total N-halo content from the N-chloro and N-bromo content in an aqueous solution. Paragraphs 5 a-d (Pages 1-2) of the Second Declaration of McKinnie are reproduced here:

[3] Filed on December 17, 2010.
[4] Exhibit 1073 in Interference No. 105,203; already of record in the prosecution.

5. The method used to determine the presence of N-halo compounds in the resulting composition was as follows.
   a. Hach Company (Loveland, CO) has two color tests developed to measure “free chlorine” and “total chlorine” in water at the few part per million (ppm) level. It is based on the chlorine oxidation of N,N-diethyl-p-phenylenediamines (DPD) to a Wurster dye that is highly colored, the intensity of which is proportional to the amount of oxidation that has occurred. EXHIBIT 1074, p. 2, col. 2, ¶¶ 1-2.
   b. N-chloro compounds are very slow to oxidize DPD but in the presence of a trace of iodide the oxidation does occur rapidly. EXHIBIT 1074, p. 3, col. 1, ¶1.
   c. While N-chloro compounds are very slow to oxidize DPD in the absence of iodide, N-bromo compounds do oxidize DPD in the absence of iodide.
   d. Thus, carrying out the analysis in the absence of iodide gives the quantity of N-bromo compound. Repeating the analysis in the presence of iodide gives the total oxidant level, which is a measure of both the N-bromo and N-chloro compounds. The ratio of the N-bromo to total oxidant level represents the mole fraction of N-bromo compounds present in the final biocide solution.

Applying this test, the Second Declaration of McKinnie reports in Paragraphs 6-8 (Pages 2-3):

6. When the pH of the aqueous alkali metal sulfamate solution prior to bromine chloride addition has a pH above 13, and upon simultaneous addition of bromine chloride with sodium hydroxide in order to maintain the pH above 13, only about 80 mole % of the N-halo sulfamate compound formed was N-bromosulfamate. The remaining about 20 mole % N-halo compound formed was N-chlorosulfamate. Similar results were achieved regardless of whether the bromine chloride was pre-prepared or made inline.
7. The above results were consistent with the fact that bromine chloride exists as an equilibrium mixture of 20 mole % Br_2, 20 mole % Cl_2, and 60 mole % BrCl.
8. By contrast, keeping the other conditions the same, but instead of using BrC1, adding first bromine, then an equal amount of chlorine, only about 60 mole % of the N-halo sulfamate solution formed was N-bromosulfamate.

Because Goodenough does not use BrCl, no N-chorosulfamates are formed in the solutions therein, so the presently claimed solutions do not have the same chemical composition as Goodenough. The statement regarding obviousness of the solutions of Goodenough relative to those of the present claims is erroneous; the questions should be whether the present claims are nonobvious.

Also discussed in the Response filed on December 17, 2010, were the redox properties of $HOCl + Br^-$ and of $HOBr + Cl^-$. In particular, it was made clear that HOBr and

Cl^- can**not** react to form HOCl. Despite that, the present Office Action states as follows:

> [I]nherently Goodenough et al. produces N-chlorosulfamate when the chloride (calcium or sodium) reacts with bromine to produce BrCl which is followed by the reaction of the BrCl with sulfamic acid to yield N-chlorosulfamate and N-bromosulfamate. (Office Action, Page 5, lines 7-11.)

This is reiterated at Page 6, lines 14-15, of the Office Action: "BrCl can be derived from the chlorides being combined with bromine in Goodenough et al." In the Declaration of Nalepa, a UV study was also reported, showing that the reaction of bleach (NaOCl) with bromide (Br^-) :

$$NaOCl + Br^- \rightarrow NaOBr + Cl^-$$

is complete within 5 minutes; no back-reaction was observed. In the Second Declaration of Nalepa, the traces for the UV study are presented in separate graphs for clarity. The graphs show that the OCl^- peak disappears and does not reappear; at the end of the reaction, all of the oxidizing halogen is in the form of OBr^-. Therefore,

$$HOBr + Cl^- \not\rightarrow HOCl + Br^-$$

The reaction of HOBr and Cl^- is equivalent to Br_2 + Cl^- (Br^+ + Cl^-) because the redox considerations are the same. Furthermore, as is well known in the art, Br_2 hydrolyzes in water to form HOBr:

$$Br_2 + H_2O \rightarrow HOBr + HBr$$

As there is no HOCl (or other Cl^+ species) formed in the solutions of Goodenough, inherently or otherwise, there is no formation of (Cl_2 and therefrom) BrCl in the solutions of Goodenough.

In this context, regarding the Declaration of Nalepa, the Office Action sets forth that

> [T]he results in the Table [from the data provided by Applicants] are not convincing since the Table shows only Bromine for the two Goodenough et al. examples instead of the BrCl that can be automatically derived from Goodenough et al combination of chemicals. (Office Action, Page 5, lines 19-22.)

If the objection to a lack of side-by-side comparison is based on the above-quoted passage, Applicants repeat that BrCl is <u>not</u> formed in Goodenough and thus such comparison is not possible. Furthermore, if BrCl were automatically derived in solutions from the Goodenough combination of chemicals, BrCl would have been present in the solutions of Goodenough

prepared for and studied in the Declaration of Nalepa, and thus the results in the Declaration of Nalepa are convincing.

Applicants respectfully request reconsideration and withdrawal of this rejection in light of the above amendments and remarks.

If any matters remain that require further consideration, the Examiner is requested to telephone the undersigned at the number given below so that such matters may be discussed, and if possible, promptly resolved.

Please continue to address all correspondence in this Application to Albemarle Corporation, at the address of record.

Respectfully submitted,

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